CS 173, Spring 2016
Examlet 3, Part B

NETID:

FIRST: | **LAST:**

Discussion: Monday 9 10 11 12 1 2 3 4 5

1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

   For any sets A, B, and C, if $A \times C \subseteq B \times C$, then $A \subseteq B$.

2. (4 points) Check the (single) box that best characterizes each item.

   $\forall x \in \mathbb{R}$, if $\pi = 3$, then $x < 20$.
   (π is the familiar constant.) true ☐ false ☐ undefined ☐

   $|A \cup B| \leq |A| + |B|$ true for all sets A ☐ true for some sets A ☐ false for all sets A ☐

3. (7 points) In $\mathbb{Z}_9$, find the value of $[5]^{41}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 8$.

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1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

   For any sets A, B, and C, $A \cup (B - C) \subseteq (A \cup B) - C$

2. (4 points) Check the (single) box that best characterizes each item.

   If $x \in A \cap B$, then $x \in A$.

   ☐ true for all sets A and B ☐ true for some sets A and B ☐ false for all sets A and B

   $\{1, 2\} \cap \emptyset =$

   ☐ $\emptyset$ ☐ $\{(1, \emptyset), (2, \emptyset)\}$ ☐ $\{1, 2, \emptyset\}$ ☐ $\{\emptyset\}$ ☐ $\{1, 2\}$ ☐ undefined

3. (7 points) In $\mathbb{Z}_{13}$, find the value of $[9]^{19} \times [8]^4$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 12$.

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1. (4 points) $A = \{\text{ginger}, \text{clove}, \text{nutmeg}\}$ $B = \{\text{ginger}, \text{vanilla}, \text{pepper}\}$ $C = \{8\}$

   $(A \cap B) \times C =$

   $(A \cap C) \times B =$

2. (4 points) Check the (single) box that best characterizes each item.

   If $x \in A - B$, then $x \in B$.

   true for all sets A and B ☐ false for all sets A and B ☐ true for some sets A and B ☐

   $\{1, 2\} \cup \emptyset =$

   $\emptyset$ ☐ $\{\emptyset\}$ ☐ $\{1, 2\}$ ☐

   $\{(1, \emptyset), (2, \emptyset)\}$ ☐ $\{1, 2, \emptyset\}$ ☐ undefined ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[8]^{22}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 10$.

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1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

   For any sets A, B, and C, if $A \subseteq B$ then $A \cap C \subseteq B \cap C$.

2. (4 points) Check the (single) box that best characterizes each item.

$\lvert A - B\rvert = \lvert A\rvert - \lvert B\rvert$	true for all sets A	☐	true for some sets A	☐
	false for all sets A	☐		
$\emptyset \in A$	true for all sets A	☐	true for some sets A	☐
	false for all sets A	☐		

3. (7 points) In $\mathbb{Z}_{13}$, find the value of $[7]^{18} + [7]^4$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 12$.

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1. (4 points) $A = \{\text{trump}, \text{rubio}\}$ $B = \{\text{clinton}, \text{sanders}\}$
   $C = \{\ (\text{trump}, \text{clinton}),\ (\text{sanders}, \text{rubio})\ \}$
   $(B \times A) - C =$

   $(A \cap C) \times B =$

2. (4 points) Check the (single) box that best characterizes each item.

   If $x \in A \cup B$, then $x \in A$.
   true for all sets A and B ☐ true for some sets A and B ☐
   false for all sets A and B ☐

   $\emptyset \subseteq A$
   true for all sets A ☐ true for some sets A ☐
   false for all sets A ☐

3. (7 points) In $\mathbb{Z}_{11}$, find the value of $[7]^{38}$. You must show your work, keeping all numbers in your calculations small. **You may not use a calculator.** You must express your final answer as $[n]$, where $0 \leq n \leq 10$.